# DOOSAN Document Transmittal

Upper Trishuli-1 HEP (216MW)

| Date | DT No.: | SHEET |
|---|---|---|
| 2022-11-02 | UT1-HEP-DHI-PC-D-0090 | 1 OF 1 |

| | | | |
|---|---|---|---|
| DOOSAN NEPAL BRANCH OFFICE | Address & Contact No. : Four Square Building, Naxal, Kathmandu, Nepal (P.O Box : 1387) + 977 1 692 3014 | Project No. H20002 | DOCUMENT DISPATCHED BY<br>Courier Service ☐<br>Messenger ☐<br>Post-Air Freight ☐<br>Document System or E-mail ■<br>By hand ■ |
| DOCUMENT DISTRIBUTION | ■ POWER CHINA (Subcontractor)<br>☐ Doosan's Site Office | | |
| SUBJECT | Review Note RN-0314_Layout Drawing of Surge Tank | | |

| S. N. | REVIEW NOTE NO. | REVIEW STATUS | DWG. / DOC. NO. | REV. | DWG. TITLE / DOC. DESCRIPTION | REMARK |
|---|---|---|---|---|---|---|
| 1 | RN-0314 | RR | UT1-C-040-CVL-DG-57001 | 0A | Layout Drawing of Surge Tank | 4 SHEET |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Received by :

Date :

Legend of Review Status
A : APPROVED
AN : APPROVED AS NOTED
RR : RETURN FOR RESUBMISSION
FI : FOR INFORMATION

DHI STAMP

Doosan Enerbility Co., Ltd
DOOSAN Enerbility
Branch Office Nepal

Issued by Doosan Enerbility

for

**Youngsoo Son**

Project Manager

Email: youngsoo.son@doosan.com
Doosan Enerbility Co., Ltd.

Discipline : Civil

# UPPER TRISHULI-1 HEP (216MW)

| | |
|---|---|
| **Client** | **Nepal Water and Energy Development Company Private Limited** |
| **Owner's Engineer** | **Tractebel Engineering GmbH / Jade Consult** |

## REVIEW NOTE

| | | | |
|---|---|---|---|
| Contractor | **Doosan Enerbility** | | |
| Title of the Document | Layout Drawing of Surge Tank | | |
| Document No. | UT1-C-040-CVL-DG-57001 | Revision | 0A |
| Date of Documents | 02.10.2022 | Received Date | 02.10.2022 |
| Transmittal Form No. | UT1-HEP-DHI-D-0423 | | |
| Previous Review Date/Status | N/A | Prev. Review Note No. | N/A |
| Review Note No. | **RN-0314** | **Present Review Date** | **02.11.2022** |
| | | **Present Review Status** | **RR** |

A: Approved AN: Approved as Noted RR: Returned for Resubmission FI: For Information, only

**Comments (see also comments red in annexes 1 to 3)**

1. The final dimensions of the surge tank are subject to final approved transient calculation.
2. The drawing under this review is a general layout drawing. Only comments regarding general layout are given. Dimensions regarding structural concrete as well as rock support are subject to the respective structural analysis and its related documents.
3. It is understood that the arch span steel roof and the steel ladder is shown indicatively only and is subject to separate design.
4. Local grid shall be implemented.
5. The dimensions of the orifice (Headrace Tunnel <-> Surge Shaft) shall be designed to respect all the operational conditions of loading and protect against detrimental effects of water hammer. With the transient calculation report and replies by the Contractor it is understood that the Contractor takes the risks associated with the current dimensions and all potential detrimental consequences and costs associated with it.
6. The design of the retaining wall of the surge chamber shall be verified (dynamic load water + earthquake).
7. The sidewalls of the surge chamber shall be lined with reinforced concrete.
8. Rock support details shall be shown in corresponding separate drawings.
9. The layout of the Air/ Ventilation tunnel shall be shown in a separate drawing.
10. The contractor shall verify and show/ explain, how/ what equipment can be placed inside the surge chamber for later inspection/ maintenance of the surge shaft (pre-installation for lifting devices in surge chamber roof, e.g. anchors?)
11. A portal structure including gate shall be foreseen at the portal of the Air/ Ventilation Tunnel.

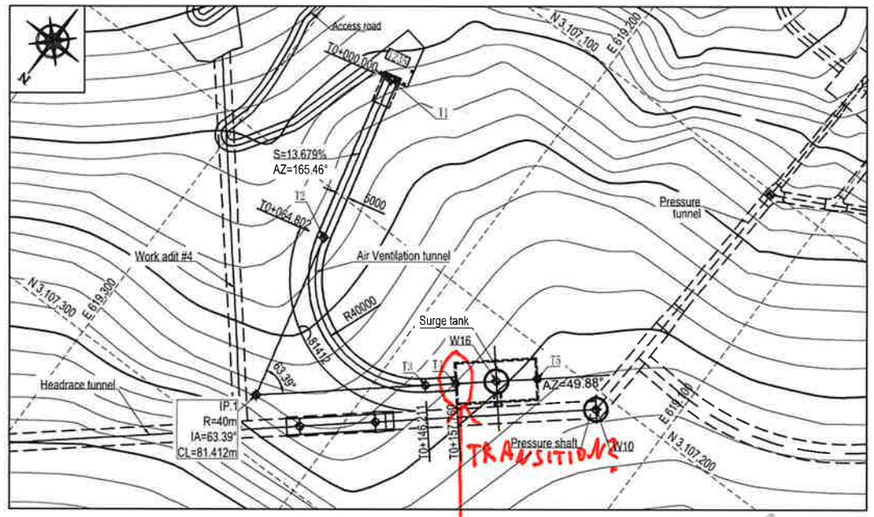
DISCLAIMER

Any approval will not release the Contractor from any of his obligations under the Contract. Despite the Engineer's approval the Contractor remains fully responsible for design, calculation, dimensioning, supply and installation without limitations.

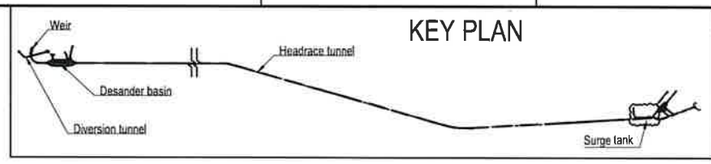
Sebastian Beck, Chief Design Engineer

RN-0314 ANNEX 1
02/11/2022

## PLAN OF SURGE TANK
1:1000




## KEY PLAN




### OCCURRENCE OF JOINT

| JOINT NO. | DIP | DIP DIRECTION | Remark |
|---|---|---|---|
| J1 (foliation) | 30° | 350° | |
| J2 | 70° | 225° | |
| J3 | 60° | 100° | |

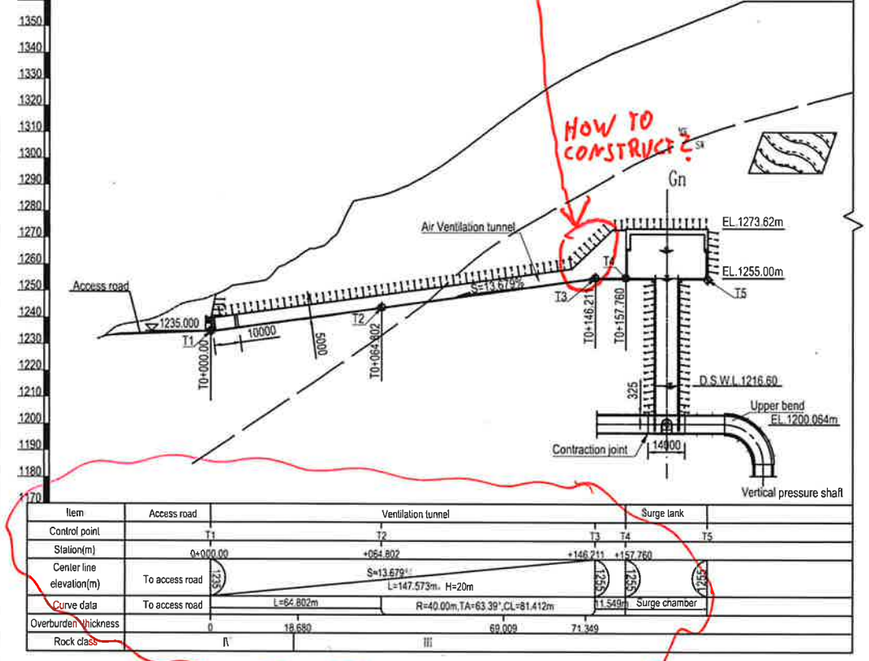
### MECHANICAL PARAMETER OF JOINT

| JOINT TYPE | C (Mpa) | φ (°) | Remark |
|---|---|---|---|
| FOLIATION | 0.2 | 35 | |
| J2/J3 | 0.15 | 28.8 | |

### COORDINATES OF AIR VENTILATION TUNNEL

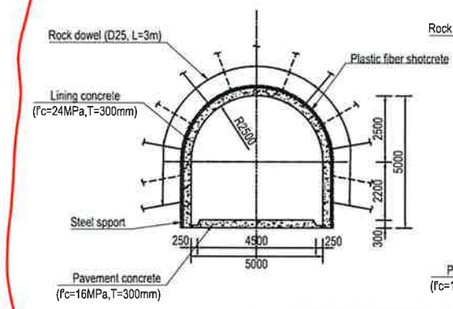
| Point No. | N | E | Remark |
|---|---|---|---|
| T1 | 3107153.498 | 619263.273 | |
| T2 | 3107216.508 | 619248.138 | R=40.00m |
| T3 | 3107237.753 | 619183.469 | |
| T4 | 3107230.316 | 619174.647 | |
| T5 | 3107210.335 | 619150.936 | |
| W16 | 3107220.324 | 619162.788 | |
| W10 | 3107206.255 | 619126.258 | |

## PROFILE FOR SUGER TANK TOP AIR VENTILATION TUNNEL
1:1000

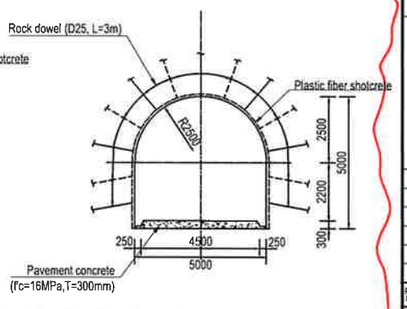



| Item | Access road | Ventilation tunnel | | | | Surge tank | |
|---|---|---|---|---|---|---|---|
| Control point | T1 | T2 | | | T3 | T4 | T5 |
| Station(m) | 0+000.00 | +064.802 | | | +146.211 | +157.760 | |
| Center line elevation(m) | To access road | S=13.679% L=147.573m, H=20m | | | | | |
| Curve data | To access road | L=64.802m | R=40.00m,TA=63.39°,CL=81.412m | | | L1.549m | Surge chamber |
| Overburden thickness | 0 | 18.680 | 69.009 | 71.349 | | | |
| Rock class | | II | III | | | | |

### TYPICAL SECTION OF AIR VENTILATION TUNNEL (FOR ROCK V) 1:100




### TYPICAL SECTION OF AIR VENTILATION TUNNEL (FOR ROCK I, II, III,IV) 1:100




### DESIGN PARAMETERS OF AIR VENTILATION TUNNEL

| Rock mass quality | 10<Q | 10>Q>4 | 4>Q>1 | 1>Q>0.1 | Q<0.1 |
|---|---|---|---|---|---|
| Support type | I | II | III | IV | V |
| Shotcrete | Spot | T=50mm (PFRS) f'c=25MPa | T=75mm(PFRS) f'c=25MPa | T=120mm(PFRS) f'c=25MPa | T=160mm(PFRS) f'c=25MPa |
| Rock dowel | Spot bolting D25,L=3m | Pattern bolting D25@2.5,L=3m (in tunnel roof) | Pattern bolting D25@2.0m,L=3m (alternative) | Pattern bolting D25@1.5m,L=3m (alternative) | Pattern bolting D25@1.0m,L=3m (alternative) |
| Steel support | | | | Steel support, MB150 (or lattice girder) (if required) | Steel support, MB150@1.0m (or lattice girder, @1.0m) |
| Supplymentary support | | | | | Forepoling grouted dowel, D25@0.4m, L=6m |

### NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
2. D denotes deformed bar, yield strength of the deformed bar is 500Mpa;
3. The cylinder specified compressive strength of shotcrete is 25MPa at age of 28 days.
4. The cylinder specified compressive strength of lining concrete and backfill concrete are 24MPa and 16MPa respectively at age of 28 days.
5. Rust preventive compound will be sprayed on exposed surface of steel structure.
6. Structures beyond surge tank shown on the drawings are only sketched and are/would be presented in related drawings.
7. Scale:

1:1000 0 10 20 30 40 50m
1:100 0 1 2 3 4 5 m

LEGEND

- Gneiss
- Excavation line
- Inferred ground water level
- Inferred boundry between moderately weathered and slight weathered
- Section of concrete

RR

### REFERENCE DRAWINGS

| | |
|---|---|
| UT1-C-150-CVL-DG-54091-01 | LAYOUT DRAWING OF HEADRACE TUNNEL |
| UT1-E-300-MEA-DC-62002 | TRANSIENT CALCULATION REPORT |

### SYMBOL AND LEGEND

**FOR APPROVAL**

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL. IT CAN BE CHANGED IN THE EXECUTION STAGE.
THIS DRAWING IS THE PROPERTY OF DOOSAN ENERBILITY CO., LTD.
IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY

| REV. NO. | DATE | DESCRIPTION | DRAWN | CHKD. | APPD. |
|---|---|---|---|---|---|
| OA | 02,OCT.,2022 | First issue | TAN Y.Q. | K.J.KIM | Y.S.SON |

PROJECT TITLE: Upper Trishuli-1 HEP (216MW)

OWNER: NWEDC

OWNER'S ENGINEER: TRACTEBEL

CONTRACTOR: DOOSAN Enerbility

DRAWING TITLE: LAYOUT DRAWING OF SURGE TANK

| INDEX | DRAWING NUMBER | SHEET NO. | REV. NO. |
|---|---|---|---|
| A | UT1-C-040-CVL-DG-57001 | 1 OF 3 | OA |

A1 (594 x 841 MM)

- WHY GEOLOGICAL INFORMATION IN GENERAL LAYOUT DRAWING 2 → SUBJECT TO SUPPORT DRAWINGS?
- AIR VENTILATION TUNNEL SEPARATE DRAWING

RN-0314, ANNEX 2
02/11/2022 YA - PS

GENERAL COMMENTS (VALID FOR ALL SHEETS):
- FINAL DIMENSIONS SUBJECT TO FINAL APPROVED TRANSIENT CALCULATION
- LOCAL GRID SHALL BE IMPLEMENTED
- AS THE DRAWING UNDER THIS REVISION IS A GENERAL LAYOUT DRAWING, ONLY COMMENTS REGARDING GENERAL ARRANGEMENT ARE GIVEN
- DIMENSIONS REGARDING CONCRETE LINING, STRUCTURAL CONCRETE AS WELL AS ROCK SUPPORT ARE SUBJECT TO STRUCTURAL THE RESPECTIVE ANALYSIS
- ARCHSPAN STEEL ROOF AND STEEL LADDER IS UNDESTOOD AS SHOWN INDICATIVELY ONLY

## PROFILE FOR SURGE TANK
1:200

## SECTION A-A
1:200

NOT TO BE CLOSED → VENTILATION!
DRAINAGE CANAL
SUPPORT BEAM TO BE INDICATED
DIMENSION? DYNAMIC LOAD WATER + EARTHQUAKE
OK!
OK!
SLIGHT INCLINATION?
FENCE SHALL BE REMOVABLE AND SHALL BE INSTALLED ONLY DURING INSPECTION
HORIZONTAL TRANSITION? (WIDENING?)
FOR EXAMPLE :
"JUMP" IN SHOWN SECTION?
CONNECTION NOT SHOWN CORRECT
CURVED
DIMENSION SEE COMMENT OE OF RN-0301
IT IS UNDERSTOOD THAT THE CONTRACTOR TAKES THE RISKS ASSOSIATED WITH THE CURRENT DIMENSIONS AND ALL POTENTIAL DETRIMENTAL CONSEQUENCES AND COSTS ASSOSIATED WITH IT.

RR

### NOTE
1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
2. Construction joints of surge shaft are subject to constructability, waterstop is set at each joint.
3. Other notes, refer to sheet 1.
4. Scale:

1:200 0 2 4 6 8 10 m
1:100 0 1 2 3 4 5 m

LEGEND:
- Section of concrete
- Excavation line

### REFERENCE DRAWINGS

| | |
|---|---|
| UT1-C-150-CVL-DG-54001-01 | LAYOUT DRAWING OF HEADRACE TUNNEL |
| UT1-E-500-MEA-DC-00002 | TRANSIENT CALCULATION REPORT |

### SYMBOL AND LEGEND

**FOR APPROVAL**

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL.
IT CAN BE CHANGED IN THE EXECUTION STAGE.
THIS DRAWING IS THE PROPERTY OF DOOSAN ENERBILITY CO., LTD
IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY

| REV. NO. | DATE | DESCRIPTION | DRAWN | CHKD. | APPD. |
|---|---|---|---|---|---|
| OA | 02.OCT.2022 | First Issue | TAN Y.Q | K.J KIM | Y.S.SON |

PROJECT TITLE: Upper Trishuli-1 HEP (216MW)

OWNER: NWEDC

OWNER'S ENGINEER: TRACTEBEL ENGIE, NEWCONSULT

CONTRACTOR: DOOSAN Enerbility

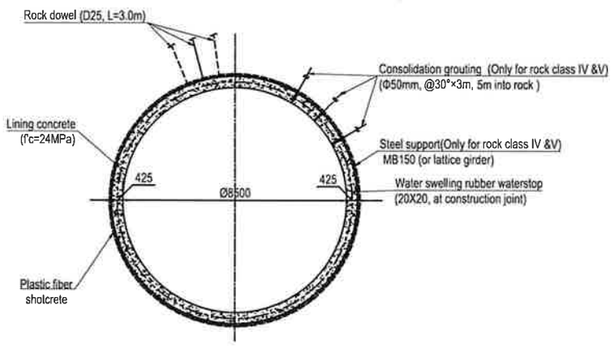
DRAWING TITLE: LAYOUT DRAWING OF SURGE TANK

| INDEX | DRAWING NUMBER | SHEET NO. | REV. NO. |
|---|---|---|---|
| A | UT1-C-040-CVL-DG-57001 | 2 OF 3 | OA |

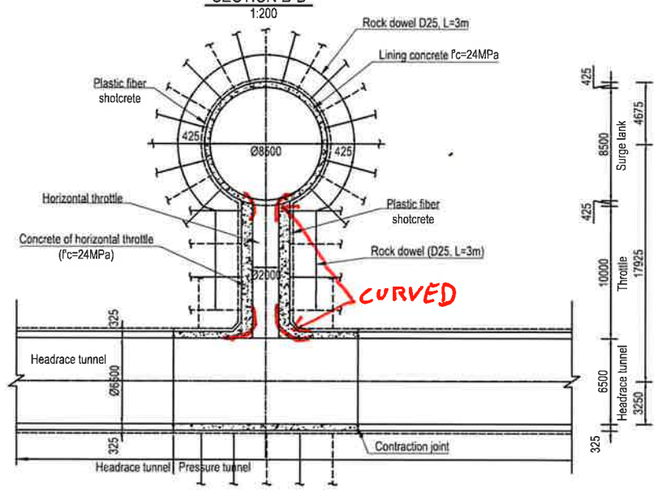
A1 (594 x 841 MM)

RN-0314, ANNEX 3
02/11/2022

## TYPICAL SECTION OF SURGE SHAFT
1:100




## SECTION B-B
1:200




GENERAL COMMENTS SEE SHEET 2 OF 3

SIDEWALL CONCRETE f'c=24MPa AS INDICATED IN PROFILE AND SECTION A-A (SHEET 2/3)

### DESIGN PARAMETERS OF SURGE CHAMBER

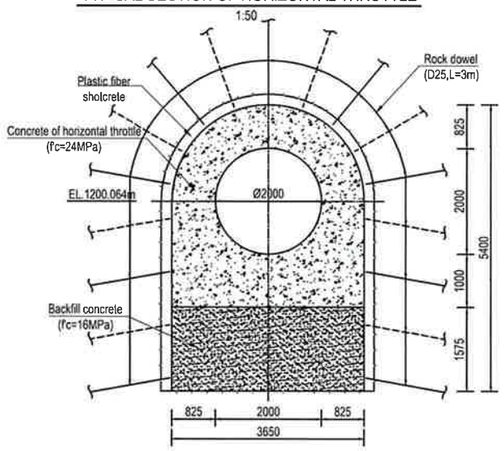
| Rock mass quality | 40<Q | 10<Q<40 | 4<Q<10 | 1<Q<4 | Q<1 |
|---|---|---|---|---|---|
| Rock class | I | II | III | IV | V |
| Shotcrete | Full section, Plastic fiber shotcrete, f' c=25MPa, T=50mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=80mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=100mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=120mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=160mm |
| Rock dowel | D25, L=5.0m(If required) | Full section, D25, L=5.0m, @2.5m×2.5m(alternately) | Full section, D25, L=5.0m, @2m×2m(alternately) | Full section, D25, L=5.0m, @1.5m×1.5m(alternately) | Full section, D25, L=5.0m, @1m×1m(alternately) |
| Steel support | | | | | Steel support, MB150@1.0m (or lattice girder, @1.0m) |

### DESIGN PARAMETERS OF SURGE SHAFT

| Rock mass quality | 10<Q | 10<Q<40 | 1<Q<10 | 1<Q<4 | Q<1 |
|---|---|---|---|---|---|
| Rock class | I | II | III | IV | V |
| Inner diameter (m) | 8.5 | | | | |
| Concrete lining | Full section, f' c=24MPa, T=125mm | | | | |
| Shotcrete | Full section, Unreinforced shotcrete, f' c=25MPa, T=50mm | | Full section, Plastic fiber shotcrete, f' c=25MPa, T=50mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=100mm | Full section, Plastic fiber shotcrete, f' c=25MPa, T=160mm |
| Rock dowel | D25, L=3m(If required) | | Full section, D25, l=3m, @2m×2m(alternately) | Full section, D25, l=3m, @1.5m×1.5m(alternately) | Full section, D25, l=3m, @1m×1m(alternately) |
| Consolidation grouting | | | | Full section, Φ50mm, @30°×3m(alternately), 5m into rock | |
| Steel support | | | | | Steel support, MB150@1.0m (or lattice girder, @1.0m) |

SUBJECT TO ROCK SUPPORT CALCULATIONS / DRAWINGS

## TYPICAL SECTION OF HORIZONTAL THROTTLE
1:50




### NOTE

1. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
2. Other notes, refer to sheet 1.
3. Scale:

1:200 0 2 4 6 8 10 m
1:100 0 1 2 3 4 5 m
1:50 0 0.5 1 1.5 2 2.5 m

LEGEND:
- Section of concrete
- Excavation line

RR

### REFERENCE DRAWINGS

| | |
|---|---|
| UT1-C-150-CVL-DG-54001-01 | LAYOUT DRAWING OF HEADRACE TUNNEL |
| UT1-E-300-MEA-DC-02002 | TRANSIENT CALCULATION REPORT |

### SYMBOL AND LEGEND

**FOR APPROVAL**

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN ARE PRELIMINARY FOR APPROVAL
IT CAN BE CHANGES IN THE EXECUTION STAGE
THIS DRAWING IS THE PROPERTY OF DOOSAN ENERBILITY CO., LTD
IT IS NOT TO BE COPIED OR USED IN ANY WAY DETRIMENTAL TO THE COMPANY

| REV. NO. | DATE | DESCRIPTION | DRAWN | CHKD. | APPD. |
|---|---|---|---|---|---|
| OA | 02.OCT.,2022 | First issue | TAN Y.Q. | K.J.KIM | Y.S.SON |

PROJECT TITLE
Upper Trishuli-1 HEP (216MW)

OWNER
NWEDC

OWNER'S ENGINEER
TRACTEBEL ENGIE, jeda TECHNOLOGY

CONTRACTOR
DOOSAN Enerbility

DRAWING TITLE
LAYOUT DRAWING OF SURGE TANK

| INDEX | DRAWING NUMBER | SHEET NO. | REV. NO. |
|---|---|---|---|
| A | UT1-C-040-CVL-DG-57001 | 3 OF 3 | OA |

A1 (594 x 841 MM)